

What is claimed is:

1. A fluid treatment device for reducing the level of a chemical compound in a fluid comprising:

a fluid inlet;

a fluid outlet;

a flow-through fluid treatment zone having comprising: a radiation source, an adsorbent and a photocatalyst;

the fluid treatment zone reversibly operable between a first mode in which the fluid flows in a first direction and at least a portion of the chemical compound is adsorbed on the adsorbent; and a second mode in which the fluid flows in a second direction different from the first direction in which the adsorbed chemical compound is exposed to radiation from the radiation resulting in photooxidation of the chemical compound.

2. The fluid treatment device defined in claim 1, wherein, in the first mode, the adsorbent comprises a fixed bed.

3. The fluid treatment device defined in claim 1, wherein, in the second mode, the photocatalyst comprises a fluidized bed.

4. The fluid treatment device defined in claim 1, wherein the photocatalyst comprises TiO_2 .

5. The fluid treatment device defined in claim 1-4, wherein the adsorbent comprises a zeolite.

6. The fluid treatment device defined in claim 1, wherein the adsorbent and the photocatalyst are comprised in the same particulate material.

7. The fluid treatment device defined in claim 1, wherein the radiation source comprises an ultraviolet radiation source.
8. The fluid treatment device defined in claim 1, wherein, in the first mode, fluid flows through the treatment zone in the first direction and, in the second mode, fluid flows through the treatment zone in the second direction different from the first direction.
9. The fluid treatment device defined in claim 8, wherein the first direction and the second direction are substantially opposed to one another.
10. The fluid treatment device defined in claim 1, wherein the radiation source is operable only in one of the first mode and the second mode.
11. The fluid treatment device defined in claim 1, wherein the fluid treatment zone comprises a screen adapted to allow concurrent fluid flow through the fluid treatment zone and retention of the adsorbent material and the photocatalyst in the fluid treatment zone.
12. The fluid treatment device defined in claim 1, further comprising a first controller for switching from the first mode to the second mode when a predetermined amount of the chemical compound has been adsorbed on the adsorbent.
13. The fluid treatment device defined in claim 1, further comprising a second controller for switching from the second mode to the first mode when a predetermined amount of the chemical compound has been photocatalyzed.
14. A fluid treatment system comprising a plurality of fluid treatment devices as defined in claim 1.

15. The fluid treatment system defined in claim 14, further comprising a controller for operation of a first subset of the plurality of fluid treatment devices in the first mode and a second subset of the plurality of fluid treatment devices in the second mode.

16. A process for reducing the level of a chemical compound in a fluid, the process comprising the steps of:

feeding the fluid to a fluid treatment device comprising a fluid inlet; a fluid outlet and a flow-through fluid treatment zone disposed between the fluid inlet and the fluid outlet, the fluid treatment device comprising: a radiation source, an adsorbent and a photocatalyst;

feeding the fluid in a first mode in which the fluid flows in a first direction and at least a portion of the chemical compound is adsorbed on the adsorbent; and

feeding the fluid in a second mode in which the fluid flows in a second direction different from the first direction in which the adsorbed chemical compound is exposed to radiation from the radiation resulting in photooxidation of the chemical compound.

17. The process defined in claim 16, wherein, in the first mode, the adsorbent is utilized as fixed bed.

18. The process defined in claim 16, wherein, in the second mode, the photocatalyst comprises a fluidized bed.

19. The process defined in claim 16, wherein the photocatalyst comprises TiO_2 .

20. The process defined in claim 16, wherein the adsorbent comprises a zeolite.

21. The process defined in claim 16, wherein the adsorbent and the photocatalyst are comprised in the same particulate material.

22. The process defined in claim 16, wherein the radiation source comprises an ultraviolet radiation source.
23. The process defined in claim 16, wherein the fluid comprises water.
24. The process defined in claim 16, wherein the first direction and the second direction are substantially opposed to one another.
25. The process defined in claim 16, wherein the radiation source is operable only in the second mode.
26. The process defined in claim 16, wherein the chemical compound is organic.
27. The process defined in claim 16, wherein the chemical compound is inorganic.
28. The fluid treatment device defined in claim 16, comprising the additional step of switching from the first mode to the second mode when a predetermined amount of the chemical compound has been adsorbed on the adsorbent.
29. The fluid treatment device defined in claim 16, comprising the additional step of switching from the second mode to the first mode when a predetermined amount of the chemical compound has been photocatalyzed.